

REPORT ON

**PHASE I
PETROLEUM CONTAMINATION
INVESTIGATION AT
ST JOHNSBURY WATER
SEWER DEPARTMENT GARAGE**

**ST JOHNSBURY
ST JOHNSBURY, VERMONT**

**Submitted by
Dufresne-Henry, Inc.**

January • 1992

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Engineering Disciplines
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Environmental
Transportation
Municipal
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Mechanical

Associated Disciplines
Surveying
Construction Management
Applied Sciences
Water Quality
Geologic
Hydrologic
Computer

January 27, 1992

Mr. Dan Scott, Town of St. Johnsbury
34 Main Street
St. Johnsbury, Vermont 05819

Re: Water & Sewer Department Garage
D-H #651033

Dear Mr. Scott:

Dufresne-Henry has completed the first phase of a Petroleum Contamination Investigation at the St. Johnsbury Water and Sewer Department Garage in St. Johnsbury, Vermont.

In accordance with our Professional Services Agreement, we hereby submit for your consideration the enclosed final report which details the work completed and presents our findings, conclusions, and recommendations.

Please review the enclosed information. If you have any questions or comments, please call us at your convenience.

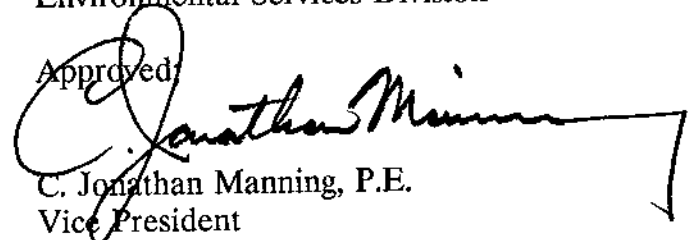
Respectfully Submitted;

DUFRESNE-HENRY, INC.



Theodore S. Reeves, P.E.
Environmental Services Division

Approved:



C. Jonathan Manning, P.E.
Vice President

TSR/CJM/djr Attachments 0127930.d

cc: Mr. Charles Schwer - Vermont Sites Management Section
Ms. Bonnie Jenks - Dufresne-Henry

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CHAPTER 1

INTRODUCTION

In response to a letter forwarded to the Town of St. Johnsbury by the Vermont Agency of Natural Resources, Sites Management Section (SMS), on November 15, 1991, Dufresne-Henry was retained by the Town to complete a Petroleum Contamination Investigation at the Sewer and Water Garage. This investigation was required in response to the removal of two underground tanks and the discovery of petroleum product in the underlying soil.

The subject property is the Sewer and Water Department Garage facility located off Western Avenue in the downtown area of St. Johnsbury. The site is very small, approximately one acre in size. Four structures are located on the property, on two story garage building, a single story garage, and two smaller equipment sheds. The majority of the site is paved. The site is bordered on the north edge by a high retaining wall, and slopes off to the southeast. The site is also bisected by storm and sanitary sewer lines. The majority of the surrounding area is commercial with some residential structures located to the west of the site.

The removed tanks were two 2,000 gallon tanks; one diesel and one gasoline. At the time the tanks were removed, a release of product was identified, presumed to be gasoline. Under the direction of Mr. Dan Scott of the St. Johnsbury Water and Sewer Department, the excavation beneath the gasoline tank location was continued to the reach of the backhoe. A fairly localized lateral area of soil was affected by the release. However, the vertical extent of impacted soil exceeded the capabilities of available equipment to excavate or access.

The release was reported to the State of Vermont Agency of Natural Resources, Hazardous Materials Management Division, Petroleum Sites Management Section (SMS). As described above, the SMS requested a site investigation be completed in a letter dated November 15, 1991.

On December 18, 1991, Dufresne-Henry submitted a work plan to the SMS and Town of St. Johnsbury for review and comment. This work plan was developed by Dufresne-Henry under the assumption that the groundwater table was within a reasonable distance from the prevailing surface. Four monitoring wells were proposed for this location. One well proposed for northeast of the former tank location, and three wells located south and southwest of the tank location. For reference a site plan has been attached as Appendix A. No specific comments were received from the SMS regarding this work plan and consequently, it was instituted as submitted. The work plan is attached as Appendix B.

CHAPTER 2

MONITORING WELL INSTALLATION

On December 23, 1991, Soils Engineering, under the observation of Dufresne-Henry began completion of soil borings and installation of groundwater monitoring wells. An HNU PI-101 photoionization detector with a 10.2 eV lamp was employed during the soil borings to assist with identification of impacted soil by petroleum products. All HNU readings are included on the boring logs. The soil boring logs are attached as Appendix C.

The first boring started was located north and east of the single story garage building which is south of the former tank location. The boring was started using continuous split spoon sampling to document changing subsurface conditions and soil types. The boring was continued to a depth of approximately 50 feet with no sign of prevailing groundwater. Fifty feet was the extent of the augers that had been brought in by Soils Engineering for this project. Boring operations were terminated for that day.

Operations on this well were resumed on December 30, 1991. Soils Engineering brought an additional 50 feet of augers with them. The decision was made to abandon continuous split spoon sampling since the soils in the boring were of consistent characteristics below (approximately) nine feet beneath the surface. Split spoon samples were recovered at five foot intervals throughout the remainder of the boring. Groundwater was encountered at approximately 94 feet beneath the ground surface. No impact from petroleum products was noted at this point. Monitoring well MW#1 was constructed in this boring.

Monitoring well MW#2 was begun on December 31, 1991. This boring was completed on the northeast side of the tank excavation, near the southeast corner of a shed, and at the base of a slope. As the boring was continued into the ground, it passed through a horizon of varved silt and clays, overlying a horizon of silty sand at 10-12 feet. Field estimates for permeability of this horizon of soil are on the order of 10^{-5} - 10^{-7} cm/sec. This area was saturated, and had a strong gasoline odor. Scans with an HNU revealed volatile organic compound (VOC's) in the range of 300 parts per million (ppm). The split spoon sample recovered at 15-17 feet also contained a characteristic odor, however, this odor was more of a "varnish" type odor, characteristic of weathered gasoline. HNU readings of this sample were approximately 200 ppm.

At this point, the decision was made to continue the boring to the bottom of the soil with the "varnish" type odor, and install a well to try and capture any perched groundwater table. This table may be perched upon the horizon of varved clay and silts. After installation of this monitoring well, subsurface activities were terminated, in consideration of time and economic constraints. Soil samples from the 5-10 foot layer and the 15-25 foot layer were saved, preserved, and sent to a American Environmental Laboratories for analysis. The requested analysis is described in Chapter 5, Results.

CHAPTER 3

FIELD MONITORING AND SAMPLING ACTIVITIES

After installation of the groundwater monitoring wells, a field location and topographic survey was completed. This survey located the major features of the site in relation to the groundwater monitoring wells and the pile of soils excavated during the tank removal.

On January 2, 1992, a groundwater sample was collected from monitoring well MW#1, and sent to American Environmental Laboratories for analysis. Specific analytes were benzene, toluene, ethylbenzene, and total xylenes ("BTEX") and methyl-tertiary-butyl-ether (MTBE). BTEX and MTBE are characteristic of gasoline, and are typically present on sites where a release of gasoline has been confirmed. The severity, and extent of a gasoline release can be mapped based upon the concentrations of BTEX and MTBE on a particular site.

Monitoring well MW#2 was accessed, however a groundwater sample could not be collected from this well, as no groundwater was present from the perched water table. Therefore, no analysis results are available for groundwater samples collected from this well.

CHAPTER 4

SITE GEOLOGY AND HYDROGEOLOGY

The property occupied by the St. Johnsbury Sewer and Water Department garage is located in the downtown area of the Village of St. Johnsbury (please see the locus plan attached as Appendix A).

The subsurface work completed at this site indicate that the upper or surficial soils are fill and/or graded materials that alter the initial and naturally occurring site topography. Typically, the upper 3-4 feet of material is disturbed soils. This layer overlies a layer of silty till, and varved clays. This layer slowly transforms into a layer of dense very fine grained sands. At approximately 25 feet beneath the surface, the soils are dry to very dry, but remain the fine to very fine light gray or brown sands. This layer of sand is dense to very dense. This soil type continued to depth of MW#1. The work completed to depth in MW#2 revealed similar soils.

As described above, the groundwater in MW#1 was found to be at elevation 566.75 feet USGS datum (as determined during groundwater sampling on January 2, 1992). This is approximately 94 feet beneath the existing surface.

Hydrogeologic features of this site are related to surficial features only. A storm sewer is located on the site which controls surface runoff. On the west side of the garage building, and extending towards the south, is a drainage swale. The site location is approximately one-half mile northeast of the Sleeper's River, and one mile northwest of the confluence of the Passumpsic and Sleeper's Rivers. The identified groundwater elevation at the site is approximately equal to the elevation of the Sleeper's River. However, since only one well was installed at this site, it is not possible to identify groundwater gradient or flow direction.

CHAPTER 5

RESULTS

A total of four samples were submitted to American Environmental Laboratories for analysis. Two soil samples were collected from MW#2 for analysis. These were sample #DH2-5' - 10' and #DH2-15'-25'. Sample #DH2-5' - 10' was analyzed for BTEX, MTBE and total petroleum hydrocarbons (TPH). Sample #DH2-15' - 25' was analyzed for BTEX and MTBE only. A Groundwater sample was collected from monitoring well MW#1 and analyzed for BTEX and MTBE, although no contaminants were present above detection limits. A field blank was collected along with the groundwater sample and analyzed, but no contaminants were detected. The analysis results for these samples are attached in Appendix D and summarized in Table 1.

ST. JOHNSBURY WATER & SEWER GARAGE RESULTS SUMMARY

SAMPLE NUMBER	MW#1	DH2-5' - 10'	DH2-15' - 25'	FIELD BLANK WATER	SDWA
PARAMETER * MATRIX	WATER	SOIL	SOIL		
BENZENE	BDL	740	BDL	3.2	5
TOLUENE	BDL	2200	BDL	BDL	2000
ETHYLBENZENE	BDL	1000	BDL	BDL	700
TOTAL XYLENES	BDL	3100	BDL	BDL	10000
TOTAL BTEX	BDL	7040	BDL	3.2	
METHYL-TERTIARY- BUTYL-ETHER	BDL	1400	BDL	8	
TOTAL PETROLEUM HYDROCARBONS	NT	109	NT	NT	

NOTE: SHADED VALUES EXCEED SAFE DRINKING WATER ACT (SDWA) LEVELS

BDL = BELOW DETECTION LIMITS

NT = NOT TESTED

* ALL CONCENTRATIONS IN ug/L (PARTS PER BILLION).

TABLE I

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

Field work on this site only resulted in limited information due to the great depth to the groundwater table. Dufresne-Henry personnel determined that installation of only one monitoring well into the permanent groundwater table was prudent at this time. The great depth to groundwater resulted in an inordinate amount of time to install the one well, and a corresponding increase in cost for that one well. The decision to only construct one well into groundwater, and employ the second well to monitor surficial conditions was based on the theory that if deep groundwater contamination was present, then additional groundwater monitoring would be required on a regional basis, rather than a local or site basis. The scope of such work is obviously beyond the scope described in our Professional Services Agreement. Additionally, if the contamination was only surficial, then work to determine the extent of the plume would need to focus on shallower soils than the deep groundwater table.

We can conclude from our efforts that a release of petroleum product, presumably gasoline, has occurred at this site. To date, no presence of product has been demonstrated in the deep groundwater table in the locality of the project site. All impact appears to be in the shallower soils underlying the site, to a depth of approximately 20 to 25 feet. The vertical migration may have been slowed or stalled due to the varved clays in the substrate. The extent of this impact is fairly localized and the impact is much more evident (based on HNU readings) in MW#2 than in MW#1.

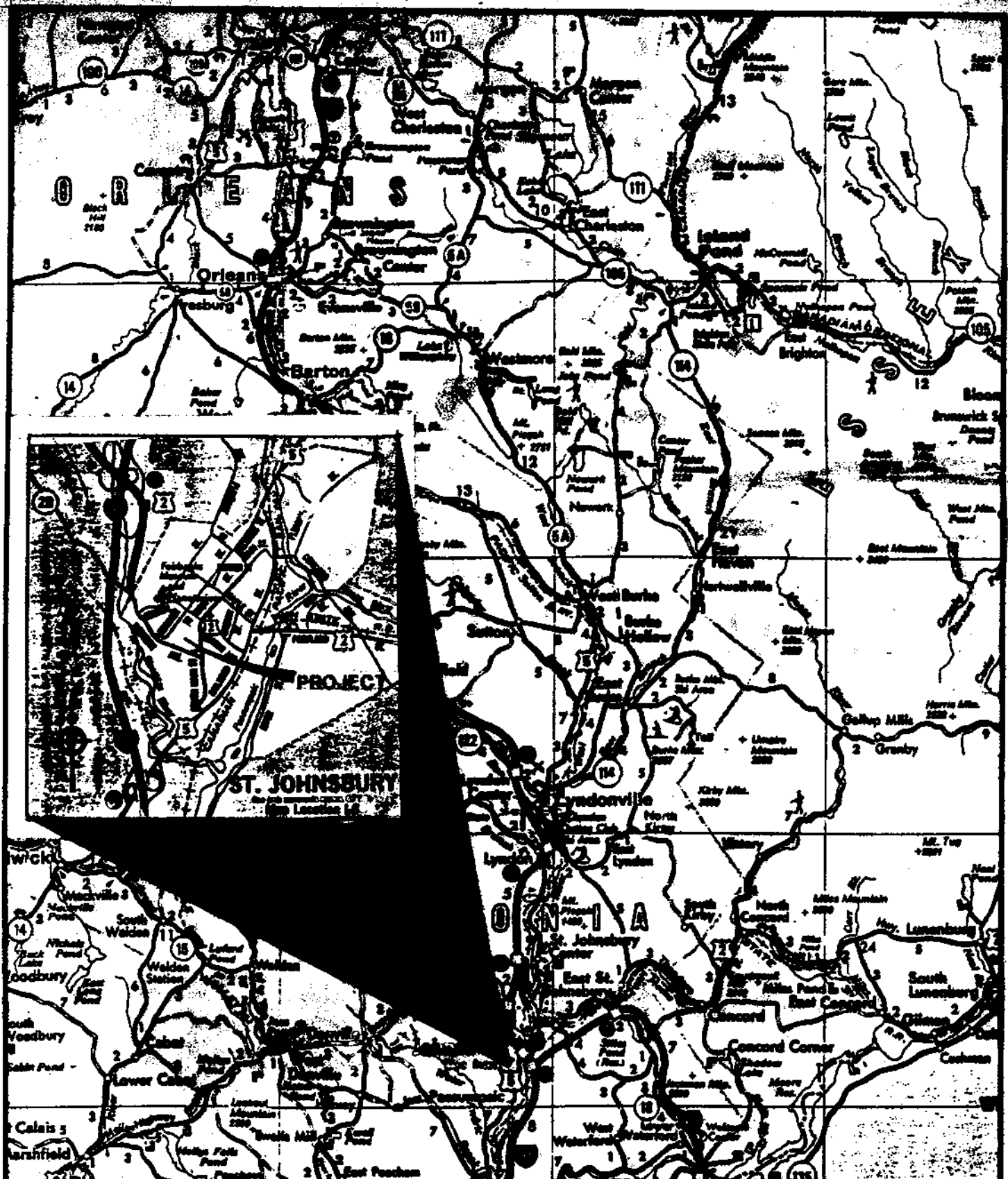
Based on the enclosed information, Dufresne-Henry recommends the following:

1. Install two or three shallow monitoring wells at selected locations on this site. The primary goal of these wells would be to monitor soil conditions in the area of the release, identify areas of greater impact, and provide access points for remedial activities, ie. soil venting.
2. Since the soil impact appears to be northeast of the tank location, install an additional monitoring well to the groundwater table to "bracket" the location of the release.
3. Collect groundwater samples from MW#1 on a regular basis to determine if the groundwater in the area becomes impacted by dissolved gasoline constituents in the future. Primary focus here should be monitoring for MTBE since it is a very polar molecule present in most gasoline grades. MTBE is not a hazardous substance list (HSL) or Safe Drinking Water Act (SDWA) compound, but it is an indicator that a gasoline plume is heading in a particular direction.

After this phase of work has been completed, a remedial plan can then be compiled to address the shallow soil contamination if it is deemed necessary.

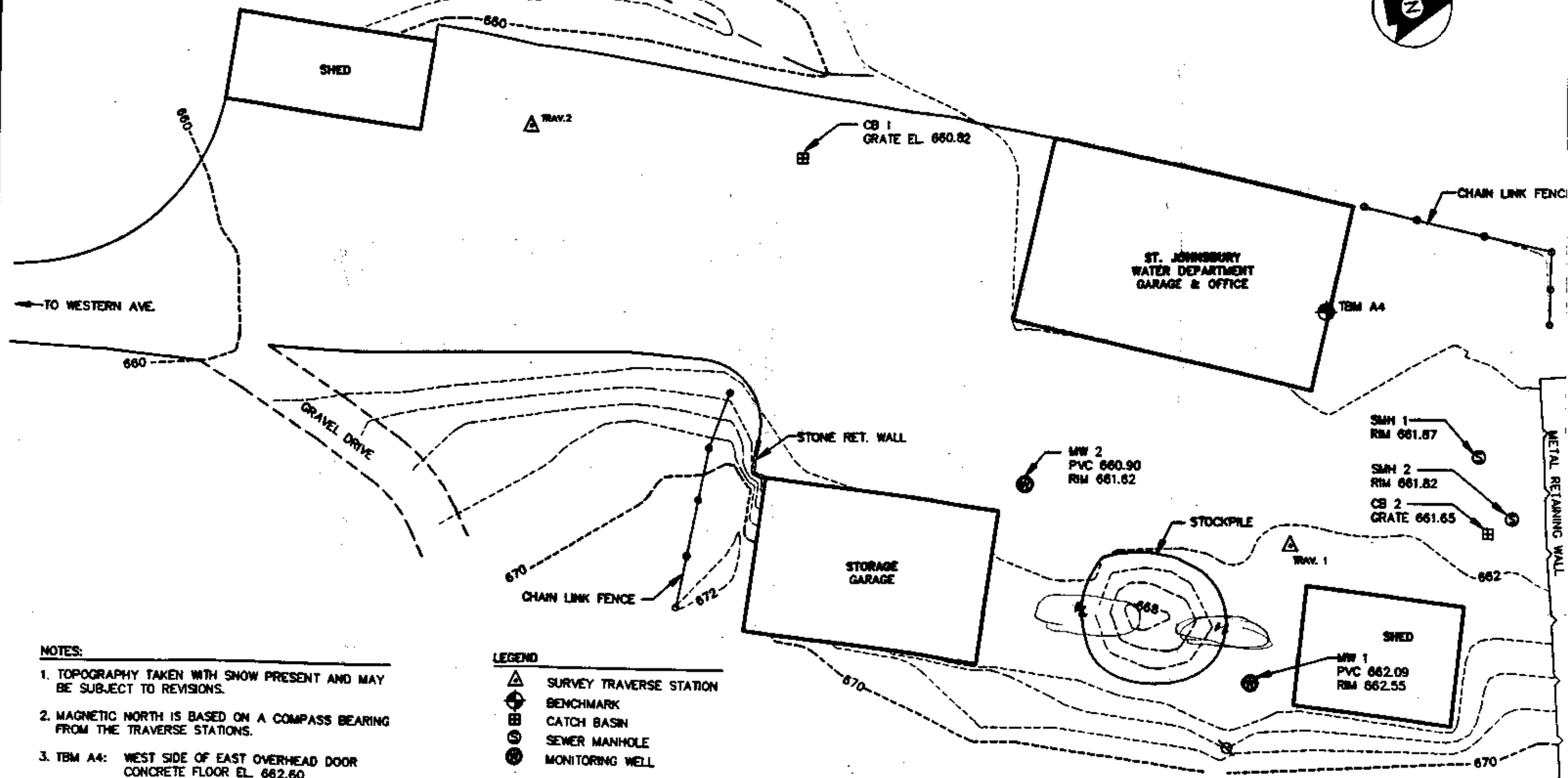
APPENDIX A

SITE AND LOCUS PLANS



LOCATION PLAN
NOT TO SCALE






Client No.	651033	TOWN OF ST. JOHNSBURY PETROLEUM CONT. INVESTIGATION		DH Dufresne-Henry Inc.
Proj. Mgr.	T.S.R.			
Date	01/92	ST. JOHNSBURY,	VERMONT	A



NOTES:

1. TOPOGRAPHY TAKEN WITH SNOW PRESENT AND MAY BE SUBJECT TO REVISIONS.
2. MAGNETIC NORTH IS BASED ON A COMPASS BEARING FROM THE TRAVERSE STATIONS.
3. TBM A4: WEST SIDE OF EAST OVERHEAD DOOR CONCRETE FLOOR EL. 662.60

LEGEND

-  SURVEY TRAVERSE STATION
-  BENCHMARK
-  CATCH BASIN
-  SEWER MANHOLE
-  MONITORING WELL

SCALE: 1"=20'



TOWN OF ST. JOHNSBURY
WATER DEPARTMENT GARAGE

SITE PLAN

ST. JOHNSBURY,

VERMONT

Client No. 251053

Proj. Mgr. T.S.R.

Date 1/14/92

3

APPENDIX B

WORK PLAN

Proposed Work Plan
Installation of Monitoring Wells

TOWN OF ST. JOHNSBURY, VERMONT
WATER AND SEWER DEPARTMENT GARAGE
PETROLEUM CONTAMINATION INVESTIGATION

This work plan outlines the boring and monitoring well program proposed for the Town of St. Johnsbury, Vermont Sewer and Water Department garage. Two underground storage tanks were previously removed from the site; a 1,000 gallon gasoline tank and a 1,000 gallon diesel fuel tank. It was reported that soil contaminated with petroleum products was encountered at that time. No water or soil samples for laboratory analysis were obtained.

The proposed monitoring wells will be used to help define the extent of the contamination plume and provide preliminary hydrogeologic data. The number and location of the borings have been chosen with these purposes in mind. It is anticipated that four (4) wells will be installed. All wells will be field located. All borings and monitoring well installations will be performed by Soils Engineering, Inc. of Charlestown, New Hampshire under the field supervision of Dufresne-Henry personnel. All personnel on the site are OSHA certified for hazardous site operations under 29 CFR part 1910.120.

BORINGS

It is anticipated that the borings for the monitoring wells will be done using 4 1/4" hollow stem augers. Hollow stem augers offer the advantages of minimal hole caving, ease of geologic sampling, and relatively easy monitoring well installation. They generally are the most cost effective method given the expected subsurface conditions. Monitoring well borings will be taken to a depth of 5' into the prevailing groundwater table or to refusal, whichever occurs first. The estimated depth of the borings is 25+ feet. Petroleum based pipe dope for use on drill rods, tools, or casing will not be allowed. No type of drilling mud, including polymers, will be used. Should flowing sands be encountered, clean water obtained locally will be used to increase hydraulic head. If flowing sands are particularly problematic, casing will be used.

SOIL SAMPLING

Soil samples will typically be taken at 5 foot intervals using a split spoon sampler. It is anticipated that continuous split spoon samples will be taken in one of the borings. Sampling at other intervals may occur and will be a field decision of the Dufresne-Henry inspector. Possible reasons include abrupt changes in drill rate and suspected, or known, zones of contamination. The split spoon sampler allows retrieval of relatively undisturbed soil samples from a known depth for classification and Volatile Organic Compound (VOC) screening. All soil samples and material from the auger flights will be screened for VOC's with an HNU PI-101 photoionization detector (10.2 eV lamp). The act of driving the sampler (Standard Penetration Test) also gives an indication of the density or degree of compaction of the soil. Representative samples from each spoon will be placed in glass jars and retained by Dufresne-Henry. These are for project records only and are not intended for chemical analysis. Detailed logs of geology, drilling data, and HNU readings will be prepared for each boring. Soil samples for laboratory analysis may be obtained if contaminated soil is encountered. Water quality samples will not be obtained during the boring

Surface Water Sampling

Hand grab samples are collected at surface water sampling locations. Samples are obtained from mid-depth of the water column in a field cleaned sampling device. Samples which will be analyzed for dissolved metals, COD, and which have observable turbidity are filtered with a 0.045u filter and immediately preserved. Field parameters of temperature, pH, and specific conductance are also measured in the water column. Conditions in the vicinity of the sampling location are noted, depth of sample below water surface, and general flow conditions.

Sample Preservation and Handling

Samples collected which require fixing with preservative chemicals are placed in sample containers with the appropriate reagent. The samples are placed in insulated chests with ice packs or ice. Samples are kept refrigerated until they are delivered to the laboratory no later than allowable according to the holding times determined by Standard Methods. Sampling personnel contact the laboratory personnel regarding sampling delivery and analysis.

Record Keeping

Field data sheets are utilized to reconstruct sampling conditions at any time after sampling. These sheets shall contain all information regarding the site: name, date, time of sampling, weather, ambient air temperature, identification numbers, and sampler's name. Field data is to include information regarding the condition of the well head and casing, well specifics (total depth, static water level, diameter, length of casing above grade, volume of water purged), sampling date (equipment used, depth sample obtained, physical properties of sample), field measurements of pH, conductivity, temperature, and the number and type of sample containers.

Chain of custody record for all samples shall be maintained. A sample shall be considered to be in the custody of an individual if it is in the direct view of, or otherwise controlled by, the individual in custody. Storage of samples during custody shall be accomplished according to established preservation techniques in appropriately sealed and numbered storage containers. Chain of custody shall be maintained during the exchange of the samples or sealed sample container directly transferred from one individual to the next with the former custodian witnessing the signature of the recipient on the chain of custody record. Chain of custody forms shall contain the following information: sample location names, field identification numbers, signature of collector, date and time of collection, number of containers transferred, parameters for analysis, all signatures of individuals involved in the chain of possession, description of sample condition, and any comments regarding sample collection.

Quality Assurance and Control

To check the integrity of field sampling and equipment cleaning techniques, the following field control procedures are used. Field blanks, and occasionally trip blanks, are used as control or external QA/QC samples to detect contamination that may be introduced in the field (atmospheric or from sampling equipment), in transit to or from the sampling site, during bottle preparation, and sample log-in or storage.

A "trip blank" follows all samples through the sampling period. The trip blank is prepared at the laboratory using organic-free water and is kept with the sample containers and samples at all times. It is not opened and is analyzed with the other samples obtained. If this sample is accidentally opened, it is noted in the chain of custody records. The trip blank is commonly used for quality control on volatile organic analyses.

A "field blank" is collected after sampling a well that previously indicated high concentrations of the water quality parameters analyzed. The sampling equipment is cleansed and a sample of distilled water is obtained using the sampling equipment. The distilled water sample is then used to prepare the field blank.

A sample replicate is used periodically to provide quality assurance for the laboratory analysis techniques. A sample is split in the field and provided to the laboratory in two or more sampling containers.

Decontamination of Field Equipment

All field equipment is rinsed with de-ionized or distilled water. This includes the electronic water sounder probe, the bailer winch spool, Teflon coated bailer wire, filter unit, and bailers. In addition, the bailers are disassembled, washed with a non-phosphate detergent, and rinsed with pressurized distilled water.

Site Health and Safety

All sampling personnel shall receive an annual medical examination to determine the baseline physiological condition. Appropriate blood chemistry work and x-rays are taken as required.

Protective clothing is worn by all site technicians during sampling. This clothing includes protective rubberized overalls, rubber gloves, and steel-toed boots. Full-face respirators with organic filter cartridges, combustible gas and oxygen detection meters, and photoionization detectors are available for the sampler's protection.

Upon arrival at the site a visual survey is performed to determine the safety of the work place. No water quality testing is performed if there is any evidence of hazardous waste disposal or the uncovering of suspected hazardous materials. Upon arrival at a monitoring well location, the cap is removed from an upwind position. The well head is allowed to vent for at least five minutes while sampling equipment is set up. No smoking or use of flammable materials is permitted adjacent to a well head.

Data Transaction, Reduction and Report Generation

Data analysis and interpretation are the responsibility of the Project Manager or Project Team member responsible for a particular task of the project. The data are compiled in table form for ease of presentation to highlight the significant information. The data may be input into the computer and plotted on various types of graphs and maps, or analyzed by various statistical methods.

Sampling Protocol Addendum for: Town of St. Johnsbury, Vermont
Water and Sewer Department garage

1. The person(s) sampling the wells will utilize an HNU photoionization detector. Immediately upon removal of the well cap, the HNU will be used to make a preliminary determination as to the VOC activity in the well.
2. A Teflon bailer will then be lowered into the well to check for the presence of free product floating on the groundwater surface. If free product is found, the well will be purged until product ceases to be observed. The well will be allowed to recover and be repurged and checked for free product. If free product is again observed, no water quality samples will be taken. If free product is not observed, the well will be sounded, purged, and sampled as outlined above.
3. Water samples will be forwarded to a contract laboratory. Analysis will be for "BTEX" and MTBE by EPA method 602/8015.

WATER QUALITY SAMPLING TECHNIQUES

Quality Assurance Document

Introduction

Sample collection for groundwater monitoring wells is performed with polyvinyl chloride (PVC) bailers for samples which are analyzed for inorganic parameters, and by Teflon bailers for organic parameters. Surface water samples are hand grab samples. All samples are collected in suitable containers and refrigerated and/or field preserved as appropriate until delivered to a certified laboratory for analysis. Samples are delivered to the laboratory as soon as possible and in all circumstances within the recommended delivery time for specific parameters. A Chain of Custody record is kept for each sample location and sampling occurrence.

Monitoring Wells

The casing and well guard are inspected for signs of vandalism or damage. The condition of the ground surface at the well head is examined for signs of surface water infiltration. Information regarding condition is noted as well as information regarding identification of the lock and key. Well casing diameter is noted. Weather conditions are noted as well as any recent rainfall or drought conditions.

Upgradient wells ("clean") are sampled prior to downgradient wells. Static water level is determined using an electronic water sounder or a tape and weight with an accuracy of ± 0.01 foot. Measurements are recorded to the nearest 0.02 foot from the top of the protective steel casing or monitoring well casing. The PVC bailer is washed with a non-ionic phosphate free detergent and rinsed with distilled water. The depth to the bottom of the well is determined and the volume of water required for purging is calculated. A minimum of three volumes of static water in the well is purged. The purged water is discarded. Teflon bailers are used for sample collection. The Teflon bailers are washed with detergent and rinsed with distilled water between sampling locations.

The color, odor, and turbidity of the sample is noted. Samples are obtained for parameters required for the specific well. An example of the parameters typically obtained immediately after the well has been flushed are: chemical oxygen demand (COD), chloride, and site specific metals. Samples may also be obtained for nitrates, calcium, manganese, sulfates, total organic compounds, total halogenated organic compounds, and volatile organic compounds. If volatile organic analysis (VOA) is required, these samples are obtained first. The VOA sample is slowly released into a clean VOA vial with as little disturbance to the sample as possible. The vial cap is retained in the hand during the process with the Teflon seal protected from all contamination. No free gases are permitted in the sample.

All samples which will be analyzed for dissolved metals and COD are field filtered using a pressurized 0.45u filter. Samples are placed in containers provided by the certified laboratory and labeled with an identification number, date, and method of preservation.

program.

MONITORING WELLS

Monitoring wells will be constructed from 2", 0.010" machine slotted, threaded, flush joint, Schedule 40 PVC. Assuming no refusal, each monitoring well will consist of 10' of screen with sufficient riser to reach approximately 2" below the surface grade. The bottom of the well will be set such that approximately 5 feet of screen extends above and below the water table observed at the time of installation. For wells with shallow depth to the water table, the screened interval will be a decision of the Dufresne-Henry inspector. The bottom of all wells will be provided with a PVC cap or point, or a plug with an expanding gasket. The annular space between the auger and the screen will be carefully backfilled with clean silica sand to create a filter pack around the well. The filter pack will extend from the bottom of the well to approximately 2 feet above the screen. At that point a seal will be installed consisting of about 1 foot of unhydrated bentonite pellets. The remainder of the hole will be backfilled with native soil to about 2 feet from the surface. Another bentonite seal will be installed and a cast iron water box (Buffalo box) will be grouted in flush at the surface. All wells will have removable top caps for sampling and sounding.

Decontamination

The borings may, or may not, be completed within the zone of contamination. However, to prevent cross contamination between the borings, strict decontamination procedures will be followed. All in-ground tools and equipment will be decontaminated by steam cleaning prior to the start of work and between borings. All decontamination will be done on-site at a designated location. Routine cleaning of equipment, such as split spoons, will use water obtained at the garage with disposal on-site. Excess contaminated soil will be stockpiled on-site at a location to be designated by the Town. The soil will be placed on a sheet of 6 mil polyethylene and then covered with the same material.

APPENDIX C

BORING LOGS

Petroleum Contamination Study
Water & Sewer Department Garage
St. Johnsbury, Vermont

12/23/91

Dufresne-Henry, Inc. (Bruce Cox) on-site at 7:55 am±.

Soils Engineering, Inc. (Myron Domingue, Richard Holmes) on-site at 8:00 am±.

Note: Rig had been dropped off at site in the late afternoon of 12/20/91.

I met with personnel of the Water & Sewer Dept to discuss proposed boring locations and potential interference with underground utilities. The locations as proposed were approved.

Steam cleaned augers and tools on-site from 9:00 am - 9:30 am.

MW DH1

Started boring at 9:35 am. Water used for washing split spoons and other tools was obtained on-site at the Water & Sewer Dept garage. Drilled with 4 1/4" hollow stem augers taking continuous split spoon samples. Split spoons were started at 1.5 feet due to frost in the ground. All soil samples were screened for VOC's with an HNU PI-101 (10.2 eV lamp). Representative soil samples (not for chemical analysis) were stored in clear glass jars and retained by Dufresne-Henry. The boring was taken to 50 feet which was the limit of the available augers. The general geologic section consists of miscellaneous fill material to a depth of about 6 feet, followed by till to approximately 9 feet, then silt and silty sand to the depth of the boring. A slight fuel oil odor was noted in the upper 5± feet with HNU readings up to 13 ppm. Below that the soil was dry - very dry with no HNU readings or any other evidence of contamination (visual or odor) in the samples or on the tools.

I called Ted Reeves advising him of the situation. The plan of action as arranged with Ted and Soils Engineering is to come back on 12/30/91 with an additional 50 feet of augers and attempt to install a well.

When the rig was shut down after reaching 50 feet, air(?) was observed to be escaping from the top of the augers. The gas could be heard and felt. No HNU readings were observed. No odor was noted nor were abnormal readings obtained with a CGI/O2/H2S meter. The W&S personnel were not aware of any potential causes. Because the rig had not been shut down prior to this time, it is not known when the situation first occurred. The augers were left in the hole and the drive cap secured.

Left site at 3:05 pm±.

Weather: sunny, calm - light breeze, temps; singles am, teens pm.

Visitors: Dan Scott and various Water & Sewer Dept employees.

12/30/91

DH (BHC) on-site at 9:08 am.

SEI (MD, RH) on-site at 9:00 am±.

Note: The boring was observed to be sucking air at our arrival. W&S personnel indicated they had noticed the same on Thursday 12/26/91.

MW DH1 continued

Started drilling at 9:25 am. The boring was continued with 4 1/4" hollow

stem augers. The sampling interval was changed to 5 feet to save time and because of the consistent nature of the soil. Water used for washing split spoons and other tools was obtained on-site at the Water & Sewer Dept garage. All soil samples were screened for VOC's with an HNU PI-101 (10.2 eV lamp). Representative soil samples (not for chemical analysis) were stored in clear glass jars and retained by Dufresne-Henry. The boring was continued to a total depth of 100 feet with no refusal. The water table was encountered at about 94 feet. No sample was taken at 100 feet to increase the chances of successfully installing a well at the bottom of the boring. The general geologic section was unchanged with silt and silty sand to the depth of the boring. No contamination (visual or odor) was observed in the samples or on the tools. Installed a 2", .010" slot, threaded, flush joint, SCHD 40 PVC well at 100'. All pipe came from factory sealed plastic bags. Sand backfill (mostly native because of heaving sand) to 86'. A bentonite seal was installed from 85' - 86'. A 6" Buffalo box was grouted in flush at the ground surface. All excess soil remained on-site. Finished at 4:30 pm±.

Materials: 10' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC.
89'10" of 2", solid wall, threaded, flush joint, SCHD 40 PVC.
50 lb± of silica sand,
25 lb± of bentonite pellets.
50 lb± of cement mix.
1 threaded PVC cap.
1 expanding gasket cap.
1 6" Buffalo box.

Left site at 4:30 pm±.

Weather: mostly overcast, calm - light breeze, temps; below 0 to teens am, teens pm.

Visitors: Dan Scott and various W&S employees.

12/31/91

DH (BHC) on site at 7:40 am±.

SEI (MD, RH) on site at 8:00 am±.

MW DH2

Started boring at 8:30 am±. Water for washing split spoons and other tools was obtained on-site at the Water & Sewer Dept garage. Drilled with 4 1/4" hollow stem augers taking split spoon soil samples at 5 foot intervals. All samples were screened for VOC's using an HNU PI-101 (10.2 eV lamp). Representative soil samples (not for chemical analysis) were stored in clear glass jars and retained by Dufresne-Henry. A moderately strong gasoline odor was observed in the sample at 10' with HNU readings of 300 ppm. A sample for possible chemical analysis was obtained at 9:00 am± and placed in a cooler. In the 15' sample a strong varnish-like odor was observed, possibly indicating that gasoline had once been in the ground. A sample for possible chemical analysis was obtained at 10:00 am± and placed in cooler. HNU readings in this material ranged from 200 ppm at shallow depths to 10 ppm at the bottom of the boring. Ted Reeves was informed of the situation and that the soil below 17' was dry and would probably continue to be to about 94'. It was decided to determine the approximate depth of the varnish-like product and then install a well as was deemed appropriate in the field. Total depth of the boring was 32' with no refusal. The general geologic section consists of miscellaneous fill to less than 5 feet, followed by varved silt and clay to about 12 feet, and then silt and silty

sand to the depth of the boring. Water was observed from a depth less than 5 feet about 16 feet. The boring was backfilled with native soil to 17'. A bentonite seal was installed from 16' - 17'. Clean silica sand was placed from 15' - 16'. Installed a 2", .010" slot, threaded, flush joint, SCHD 40 PVC well at 15'. All pipe came from factory sealed plastic bags. The annular space was backfilled with silica sand to 4'. A bentonite seal was installed from 3' - 4'. A 6" Buffalo box was grouted in flush at the ground surface.

Materials: 10' of 2", .010" slot, threaded, flush joint, SCHD 40 PVC.
4'10" of 2", solid wall, threaded, flush joint, SCHD 40 PVC.
300 lb± of silica sand.
50 lb± of bentonite pellets.
50 lb± of cement mix.
1 threaded PVC cap.
1 expanding gasket cap.
1 6" Buffalo box.

Left site at 1:15 pm. Dan Scott was informed that only the two wells would be installed at this time pending the results of soil and water sample analysis and consultation with the State.

Weather: partly - mostly sunny, calm - light breeze, temps; singles am, 20's pm.

Visitors: Dan Scott and various W&S employees.

BORING LOCATION MW DH1		INCLINATION V		BEARING		DATE START/FINISH 12/23/91 / 12/30/91	
CASING ID		CORE SIZE		TOTAL DEPTH 100 FT		DRILLED BY: SOILS ENGINEERING, INC. (M.D.)	
GROUND EL (MSL)		DEPTH TO WATER/DATE 94± FT/		IMMED.		LOGGED BY: B. COX	

ELEV MSL FT	SAMPLE			SAMP OD IN	LENGTH		REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	DEPTH FT	TYPE AND NO.	B		REC IN	PENETRA- TION IN			
	1.5						4 1/4" HSA	8"/CCH	0" - 2"± Bituminous concrete. 2" - 1'6" FILL.
	3.5	SS 1	11 18 9 12	2	13	24			Miscellaneous sand and gravel FILL. Top 1"± of sample has a slight fuel oil odor. 13 ppm. Dry at bottom. No odor. 0 ppm.
	5.5	SS 2	15 12 10 10	2	12	24			Miscellaneous till FILL. At 4'6"± is a 2" medium brown, medium grained sand layer. Below is a 2" layer of black ash and cinders. Below is till fill. Dry. Slight oil odor. 1 - 2 ppm.
	7.5	SS 3	3 4 6 11	2	20	24			5'6" - 5'8" Black, oily looking soil. Slight oil odor. Moist. 0 ppm. 5'8" - 7'6" Medium brown gray, loose - medium dense TILL. Very fine - fine grained sand. 30%± non plastic fines. 10%± fine gravel. Moist. No odor or staining. 0 ppm.
	9.5	SS 4	12 11 12 9	2	18	24			7'6" - 8'11" Medium - dark brown gray, medium dense, silty TILL similar to above. Very fine - fine grained, well sorted sand. 40%± non - slightly plastic fines. Slightly moist. No odor or staining. 0 ppm. 8'11" - 9'6" Medium - dark, very slightly reddish brown, silty SAND. Very fine - fine grained, well sorted sand. 20%± non plastic fines. Slight layering. Moist. No odor or staining. 0 ppm.
	11.5	SS 5	6 6 5 4	2	20	24			9'6" - 9'11" Slightly reddish brown silty SAND as above. Moist. Slight oily odor. 1 ppm. 9'11" - 11'6" Light brown, loose - medium dense, silty SAND. Very fine grained, well sorted sand. 30%± non plastic fines. Abundant, very thin (1/32"±) horizontal layers of medium brown, very fine grained silty sand. Dry. No odor or staining. Trace ppm.
	13.5	SS 6	4 5 4 6	2	17	24			Light gray brown, loose - medium dense, silty SAND similar to above but with rare brown layers. 30%± non plastic fines. Dry. No odor or staining. 0 ppm.
	15.5	SS 7	7 8 10 12	2	18	24			Light gray brown, medium dense, sandy SILT. Very fine - fine grained, well sorted sand. 50%± non plastic fines. Grayer bottom 1". Dry - moist. No odor or staining. Trace ppm.
	17.5	SS 8	7 10 10 14	2	20	24			Light - medium gray, medium dense, sandy SILT as above. Very faint layering, particularly bottom 5"±. Dry. No odor or staining. 0 ppm.

<p>B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.</p> <p>REC - Length of sample recovered.</p> <p>SS - Split spoon sample.</p> <p>U - Undisturbed samples</p> <p>S - Shelby tube N - Denison</p> <p>F - Fixed piston P - Pitcher</p> <p>O - Osterberg</p> <p>SAMP OD - Outside diameter of sampling spoon</p>	<p>NOTES</p> <p>HSA = Hollow Stem Auger</p> <p>CCH = Conical Cutter Head</p> <p>ppm: Refers to HNU reading (10.2 eV lamp)</p>	<p style="text-align: center;">Town of St. Johnsbury Water & Sewer Department Garage</p> <p>St. Johnsbury, Vermont</p> <p>DATE: 12/23/91 PROJECT: 651033</p>
		<div>PAGE 1 OF 5</div> <div>LOG OF BORING: DH1</div>

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW DH1		INCLINATION V		BEARING		DATE START/FINISH 12/23/91 / 12/30/91	
CASING ID		CORE SIZE		TOTAL DEPTH 100 FT		DRILLED BY: SOILS ENGINEERING, INC. (M.D.)	
GROUND EL (MSL)		DEPTH TO WATER/DATE 94± FT/ IMMED.		LOGGED BY: B. COX			

ELEV MSL FT	SAMPLE			SAMP OD IN	LENGTH		REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	DEPTH FT	TYPE AND NO.	B		REC IN	PENETRA- TION IN			
	19.5	SS 9	13 14 14 15	2	19	24			17'6" - 18'5" Light - medium gray, sandy SILT as above. Slightly moist. No odor. 0 ppm. 18'5" - 19'1" Medium - dark brown, silty SAND. Slightly moist. No odor or staining. 0 ppm. 19'1" - 19'6" Light brown gray, silty SAND. Very fine grained, well sorted sand. Discontinuous layers of dark brown, very fine - fine grained sand. Slightly moist. No odor. 0 ppm.
	21.5	SS 10	7 9 9 6	2	18	24			Medium gray brown, medium dense, sandy SILT. Very fine - fine grained, well sorted sand. 50%+ non plastic fines. At 19'8" is a 2" layer of prominent, discontinuous, medium - dark orange mottles. Very silty at bottom. Damp below 21'. Wet at 21'3". No odor or staining. 0 ppm.
	23.5	SS 11	7 13 14 14	2	15	24			21'6" - 22' SILT as above. Saturated. No odor or staining. 0 ppm. 22' - 23'6" Light - medium gray, medium dense, silty SAND. Very fine - fine grained, well sorted sand. 20% - 30% non plastic fines. Occasional layers of red fine grained sand and light gray medium grained sand. 1" medium gray silt layer at top of interval. 1/8" thick very dark rust colored mottle at bottom. Damp. No odor or staining. 0 ppm.
	25.5	SS 12	9 13 14 12	2	24	24			Alternating light gray fine grained SAND with mottles and medium gray SILT with some mottles. Thickness of each layer varies from 1/4" - 2"±. Moist. No odor or staining. 0 ppm.
	27.5	SS 13	10 15 17 12	2	20	24			Light gray, medium dense - dense, silty SAND. Very fine - fine grained, well sorted, rounded sand of quartz and rock fragments. 10% - 20% non plastic fines. Faint, discontinuous, light - medium orange mottles throughout. Dry. No odor or staining. 0 ppm.
	29.5	SS 14	12 17 18 19	2	19	24			27'6" - 28'1" Light gray, dense, silty SAND as above. 28'1" - 28'2" Medium gray, silty SAND. Fine grained sand. 40%+ non plastic fines. 28'2" - 28'7" Medium gray sandy SILT. 28'7" - 29'6" Light brown, silty SAND. Very fine - fine grained, well sorted sand. 30%+ non plastic fines. Dark orange - rust mottle at 28'. Dry. No odor or staining. 0 ppm.
	31.5	SS 15	7 19 20 23	2	21	24			Light brown, medium dense - dense, silty SAND as above. Dry. No odor or staining. 0 ppm.

<p>B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.</p> <p>REC - Length of sample recovered.</p> <p>SS - Split spoon sample.</p> <p>U - Undisturbed samples</p> <p>S - Shelby tube N - Denison</p> <p>F - Fixed piston P - Pitcher</p> <p>O - Osterberg</p> <p>SAMP OD - Outside diameter of sampling spoon</p>	<p>NOTES</p> <p>HSA = Hollow Stem Auger</p> <p>CCH = Conical Cutter Head</p> <p>ppm: Refers to KNU reading (10.2 eV lamp)</p>	<p style="text-align: center;">Town of St. Johnsbury Water & Sewer Department Garage</p> <p>St. Johnsbury, Vermont</p> <p>DATE: 12/23/91 PROJECT: 651033</p>
		<div>PAGE 2 OF 5</div> <div>LOG OF BORING: DH1</div>

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW DH1		INCLINATION V		BEARING		DATE START/FINISH 12/23/91 / 12/30/91	
CASING ID		CORE SIZE		TOTAL DEPTH 100 FT		DRILLED BY: SOILS ENGINEERING, INC. (M.D.)	
GROUND EL (MSL)		DEPTH TO WATER/DATE 94± FT/ IMMED.		LOGGED BY: B. COX			

ELEV MSL FT	SAMPLE			SAMP OD IN	LENGTH		REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	DEPTH FT	TYPE AND NO.	B		REC IN	PENETRA- TION IN			
		SS 16	17 16 38 35	2	13	24			Light brown, dense - very dense, silty SAND similar to above. Very fine - occasionally medium grained, moderately well sorted sand. 30%+ non plastic fines. Abundant, horizontal, thin (1/16") prominent, medium - dark orange mottles throughout. Dry, but slightly moister than above. No odor or staining. 0 ppm.
	33.5								
		SS 17	35 16 16 19	2	20	24			Light brown, dense - very dense, silty SAND as above. Not as mottled. Dry. No odor or staining. 0 ppm.
	35.5								
		SS 18	27 15 17 19	2	21	24			Light brown, dense - very dense, silty SAND as above. Slightly coarser grained. Dry. No odor or staining. 0 ppm.
	37.5								
	40						4 1/4" HSA	8"/CCH	Probable SAND as above.
		SS 19	14 21 21 27	2	22	24			Light brown, dense, silty SAND as above. Dry. No odor or staining. 0 ppm.
	42								
	45						4 1/4" HSA	8"/CCH	Probable SAND as above.
		SS 20	12 19 21 26	2	18	24			Light - medium (slightly grayish) brown, medium dense - dense, silty SAND. Very fine - coarse grained (predominately fine - medium), moderately well sorted sand. 10% - 20% non plastic fines. Dry. No odor or staining. 0 ppm.
	47								
	50						4 1/4" HSA	8"/CCH	Probable SAND as above.
		SS 21	14 19 17 20	2	18	24			Light - medium brown, dense, silty SAND similar to above. Predominately fine - medium grained, moderately well sorted sand of quartz and rock fragments. Dry No odor or staining. 0 ppm.
	52								
	55						12/30/91 4 1/4" HSA	8"/CCH	Probable SAND as above.
		SS 22	22 27 38 40	2	19	24			Light - medium orange brown, very dense, silty SAND. Very fine - fine grained, well sorted sand. 30%+ non plastic fines. Faint, fine, mottles throughout. Dry - moist. No odor or staining. 0 ppm.
	57								
	60						4 1/4" HSA	8"/CCH	Probable SAND as above.
		SS 23	15 20 24	2	20	24			Light - medium gray brown, medium dense - dense, silty SAND. Very fine - medium grained, moderately well sorted sand. 20% - 30% non plastic fines.

<p>B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.</p> <p>REC - Length of sample recovered.</p> <p>SS - Split spoon sample.</p> <p>U - Undisturbed samples</p> <p>S - Shelby tube N - Denison</p> <p>F - Fixed piston P - Pitcher</p> <p>O - Osterberg</p> <p>SAMP OD - Outside diameter of sampling spoon</p>	<p>NOTES</p> <p>HSA = Hollow Stem Auger</p> <p>CCH = Conical Cutter Head</p> <p>ppm: Refers to HNU reading (10.2 eV lamp)</p>	<p style="text-align: center;">Town of St. Johnsbury Water & Sewer Department Garage</p> <p>St. Johnsbury, Vermont</p> <p>DATE: 12/30/91 PROJECT: 651033</p>
		<p>PAGE 3 OF 5 LOG OF BORING: DH1</p>

BORING LOCATION MW DH1		INCLINATION V		BEARING		DATE START/FINISH 12/23/91 / 12/30/91	
CASING ID		CORE SIZE		TOTAL DEPTH 100 FT		DRILLED BY: SOILS ENGINEERING, INC. (M.D.)	
GROUND EL (MSL)		DEPTH TO WATER/DATE 94± FT/ IMMED.		LOGGED BY: B. COX			

ELEV MSL FT	SAMPLE			SAMP OD IN	LENGTH		REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	DEPTH FT	TYPE AND NO.	B		REC IN	PENETRA- TION IN			
	62		25						Gets slightly coarser with depth. Dry. No odor or staining. 0 ppm.
	65						4 1/4" HSA	8"/CCH	Probable SAND as above.
	67	SS 24	15 20 28	2	19	24			Medium brown, dense - very dense, silty SAND similar to above. Slightly browner. Slightly more orange 66'8" - 66'10". Very fine - occasionally coarse grained (predominately fine - medium), moderately poorly sorted sand. Dry. No odor or staining. 0 ppm.
	70						4 1/4" HSA	8"/CCH	Probable SAND as above.
	72	SS 25	23 31 35 36	2	18	24			Light - medium brown, very dense, SAND. Very fine - coarse grained (predominately medium - coarse), poorly sorted sand. 10%+ non plastic fines. 10%+ fine rounded gravel to 1/4". Dry. No odor or staining. 0 ppm.
	75						4 1/4" HSA	8"/CCH	Probable sand similar to above but becoming finer grained with no gravel.
	77	SS 26	22 24 27 27	2	18	24			75' - 76'± SAND as above. 76' - 76'2" Medium orange brown, dense sandy SILT Very fine - fine grained, well sorted sand. 50%+ non plastic fines. Dry. No odor or staining. 76'2" - 77' Light - medium gray brown, dense - very dense silty SAND. Very fine - rarely medium grained, moderately well sorted sand. 20%± non plastic fines. Dry. No odor or staining. 0 ppm.
	80						4 1/4" HSA	8"/CCH	Probable SAND similar to above but becoming grayer
	82	SS 27	21 26 35 44	2	21	24			80' - 81' Light - medium gray, dense - very dense silty SAND. Very fine - fine grained, well sorted sand. 20% - 30% non plastic fines. Dry. No odor or staining. 0 ppm. 81' - 81'2" Medium orange brown silty SAND. Very fine - fine grained, well sorted sand. 20%± non plastic fines. Prominent, continuous, very dark orange - rust mottles at 81'1". 81'2" - 82' Light - medium gray, silty SAND similar to above. 1/8" - 1/4" medium gray silty varves bottom 4". Moist at bottom. No odor or staining. 0 ppm.
	85						4 1/4" HSA	8"/CCH	Probable SAND similar to above.
		SS 28	19 37	2	18	24			85' - 86'6" Light - medium gray, very dense, SAND Medium - coarse grained, moderately well sorted sand. 10%± non plastic fines. Abundant, medium orange mottles in 1"± bands. Dry - slightly moist 0 ppm.

<p>B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.</p> <p>REC - Length of sample recovered.</p> <p>SS - Split spoon sample.</p> <p>U - Undisturbed samples</p> <p>S - Shelby tube N - Denison</p> <p>F - Fixed piston P - Pitcher</p> <p>O - Osterberg</p> <p>SAMP OD - Outside diameter of sampling spoon</p>	<p>NOTES</p> <p>HSA = Hollow Stem Auger</p> <p>CCH = Conical Cutter Head</p> <p>ppm: Refers to HNU reading (10.2 eV lamp)</p>	<p style="text-align: center;">Town of St. Johnsbury Water & Sewer Department Garage</p> <p>St. Johnsbury, Vermont</p> <p>DATE: 12/30/91 PROJECT: 651033</p>
		<p>PAGE 4 OF 5 LOG OF BORING: DH1</p>

DH DUFRESNE-HENRY, INC.

BORING LOCATION MW DH1		INCLINATION V		BEARING		DATE START/FINISH 12/23/91 / 12/30/91	
CASING ID		CORE SIZE		TOTAL DEPTH 100 FT		DRILLED BY: SOILS ENGINEERING, INC. (M.D.)	
GROUND EL (MSL)		DEPTH TO WATER/DATE 94±		FT/ IMMED.		LOGGED BY: B. COX	

ELEV MSL FT	SAMPLE			SAMP OD IN	LENGTH		REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	DEPTH FT	TYPE AND NO.	8		REC IN	PENETRA- TION IN			
			52						86'6" - 87' Medium gray and medium orange, silty SAND. Very fine - fine grained, well sorted sand. Abundant medium orange mottles throughout. Dry - moist. No odor or staining. 0 ppm.
	87		58						
	90						4 1/4" HSA	8"/CCH	Probable SAND similar to above.
			33						90' - 90'2" Light - medium gray SAND similar to above but coarser grained (fine - occasionally coarse grained). 90'2" - 90'5" Medium orange brown, silty SAND. Very fine - fine grained, well sorted sand. 20%+ non plastic fines. Thin (1/8") medium gray silty layer at 90'4" with dark orange - rust colored mottle underneath. 90'5" - 91'6" Light - medium gray SAND. Medium - very coarse grained top 2" grading to predominately medium grained at bottom. 10%+ non plastic fines. Dry. No odor or staining. 0 ppm.
		SS 29	51	2	14	18			
	91.5		55						
	95						4 1/4" HSA	8"/CCH	Probable SAND similar to above. Water at 94'±.
			33						Medium brown and medium gray brown, very dense, SAND. Fine - very coarse grained, poorly sorted sand of quartz and rock fragments. 10%+ non plastic fines. Trace fine rounded gravel. Fine silty sand bottom 3" with 1/8" medium gray silty layer on top and with thin mottles on either side. Saturated. No odor or staining. 0 ppm.
		SS 30	39	2	18	18			
	96.5		51						
	100						4 1/4" HSA	8"/CCH	Probable SAND similar to above.
									<p>No refusal to depth.</p> <p>Set 10' of 2", .010" slot, threaded, flush joint SCHD 40 PVC at 100'. Sand backfill to 86'. Bentonite seal 85' - 86'. Grouted in flush 6" Buffalo box.</p>

<p>B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.</p> <p>REC - Length of sample recovered.</p> <p>SS - Split spoon sample.</p> <p>U - Undisturbed samples</p> <p style="margin-left: 20px;">S - Shelby tube N - Denison</p> <p style="margin-left: 20px;">F - Fixed piston P - Pitcher</p> <p style="margin-left: 20px;">O - Osterberg</p> <p>SAMP OD - Outside diameter of sampling spoon</p>	<p>NOTES</p> <p>HSA = Hollow Stem Auger</p> <p>CCH = Conical Cutter Head</p> <p>ppm: Refers to HNU reading (10.2 eV lamp)</p>	<p style="text-align: center;">Town of St. Johnsbury Water & Sewer Department Garage</p> <p>St. Johnsbury, Vermont</p> <p>DATE: 12/30/91 PROJECT: 651033</p>		
		<table style="width:100%;"> <tr> <td style="width:50%;">PAGE 5 OF 5</td> <td style="width:50%;">LOG OF BORING: DH1</td> </tr> </table>	PAGE 5 OF 5	LOG OF BORING: DH1
PAGE 5 OF 5	LOG OF BORING: DH1			

BORING LOCATION MW DH2		INCLINATION V		BEARING		DATE START/FINISH 12/31/91 / 12/31/91	
CASING ID		CORE SIZE		TOTAL DEPTH 32 FT		DRILLED BY: SOILS ENGINEERING, INC. (M.D.)	
GROUND EL (MSL)		DEPTH TO WATER/DATE		FT/		LOGGED BY: B. COX	

ELEV MSL FT	SAMPLE			SAMP OD IN	LENGTH		REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	DEPTH FT	TYPE AND NO.	B		REC IN	PENETRA- TION IN			
	5						4 1/4" HSA	8"/CCH	Miscellaneous silty, sandy FILL.
	7	SS 1	2 3 2 1	2	24	24			Dark gray, soft - medium stiff, varved SILT and CLAY. Saturated. No odor or staining. 0 ppm.
	10						4 1/4" HSA	8"/CCH	Probable varved SILT and CLAY similar to above.
	12	SS 2	4 4 5 7	2	24	24			Dark gray, medium stiff - stiff, varved SILT and CLAY similar to above. Bottom 2" is medium brown fine - medium grained sand. Saturated. Moderately strong gasoline odor throughout. 300 ppm.
	15						4 1/4" HSA	8"/CCH	Probable SAND similar to above.
	17	SS 3	9 12 14 14	2	20	24			15' - 16'+ Medium - dark gray, medium dense, silty SAND. Saturated. Strong varnish-like odor. 16' - 17' Light - medium brown, medium dense, silty SAND. Very fine - fine grained, well sorted sand. 30%+ non plastic fines. Occasional medium gray silty layers. Occasional medium orange mottles. Moist. Strong varnish-like odor throughout. 180 - 200 ppm.
	20						4 1/4" HSA	8"/CCH	Probable SAND similar to above.
	22	SS 4	6 10 12 17	2	16	24			Light - medium gray, medium dense, sandy SILT. Very fine - fine grained, well sorted sand. 70%+ non plastic fines. Occasional thin (to 1/8"), prominent, continuous, medium orange mottles. Dry. Moderately strong varnish-like odor. 150 - 200 ppm
	25						4 1/4" HSA	8"/CCH	Probable SAND similar to above.
	27	SS 5	12 17 16 16	2	16	24			25' - 26' Light - medium gray, dense, sandy SILT similar to above. Dry. Moderate varnish-like odor. 26' - 26'2" Medium brown silty SAND. Very fine - fine grained sand. Stronger varnish-like odor than above. 26'2" - 27' Light gray, medium dense - dense, sandy SILT. Very fine grained sand. 70%+ non plastic fines. Dry. Faint varnish-like odor. 50 - 80 ppm.
	30						4 1/4" HSA	8"/CCH	Probable silty SAND or sandy SILT similar to above
			11 16						30' - 31'1" Light - medium gray, medium dense, silty SAND. Very fine - fine grained, well sorted sand. 20%+ non plastic fines. Occasional thin (to 1/4") medium gray silty layers. Abundant very thin (to 1/6"), prominent, continuous, medium - dark orange mottles. Dry. No odor or staining.

<p>B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.</p> <p>REC - Length of sample recovered.</p> <p>SS - Split spoon sample.</p> <p>U - Undisturbed samples</p> <p>S - Shelby tube N - Denison</p> <p>F - Fixed piston P - Pitcher</p> <p>O - Osterberg</p> <p>SAMP OD - Outside diameter of sampling spoon</p>	<p>NOTES</p> <p>HSA = Hollow Stem Auger</p> <p>CCH = Conical Cutter Head</p> <p>ppm: Refers to HNU reading (10.2 eV lamp)</p>	<p>Town of St. Johnsbury Water & Sewer Department Garage</p> <p>St. Johnsbury, Vermont</p> <p>DATE: 12/31/91 PROJECT: 651033</p>
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DH DUFRESNE-HENRY, INC.

BORING LOCATION MW DH2		INCLINATION V		BEARING		DATE START/FINISH 12/31/91 / 12/31/91	
CASING ID		CORE SIZE		TOTAL DEPTH 32 FT		DRILLED BY: SOILS ENGINEERING, INC. (M.D.)	
GROUND EL (MSL)		DEPTH TO WATER/DATE		FT/		LOGGED BY: B. COX	

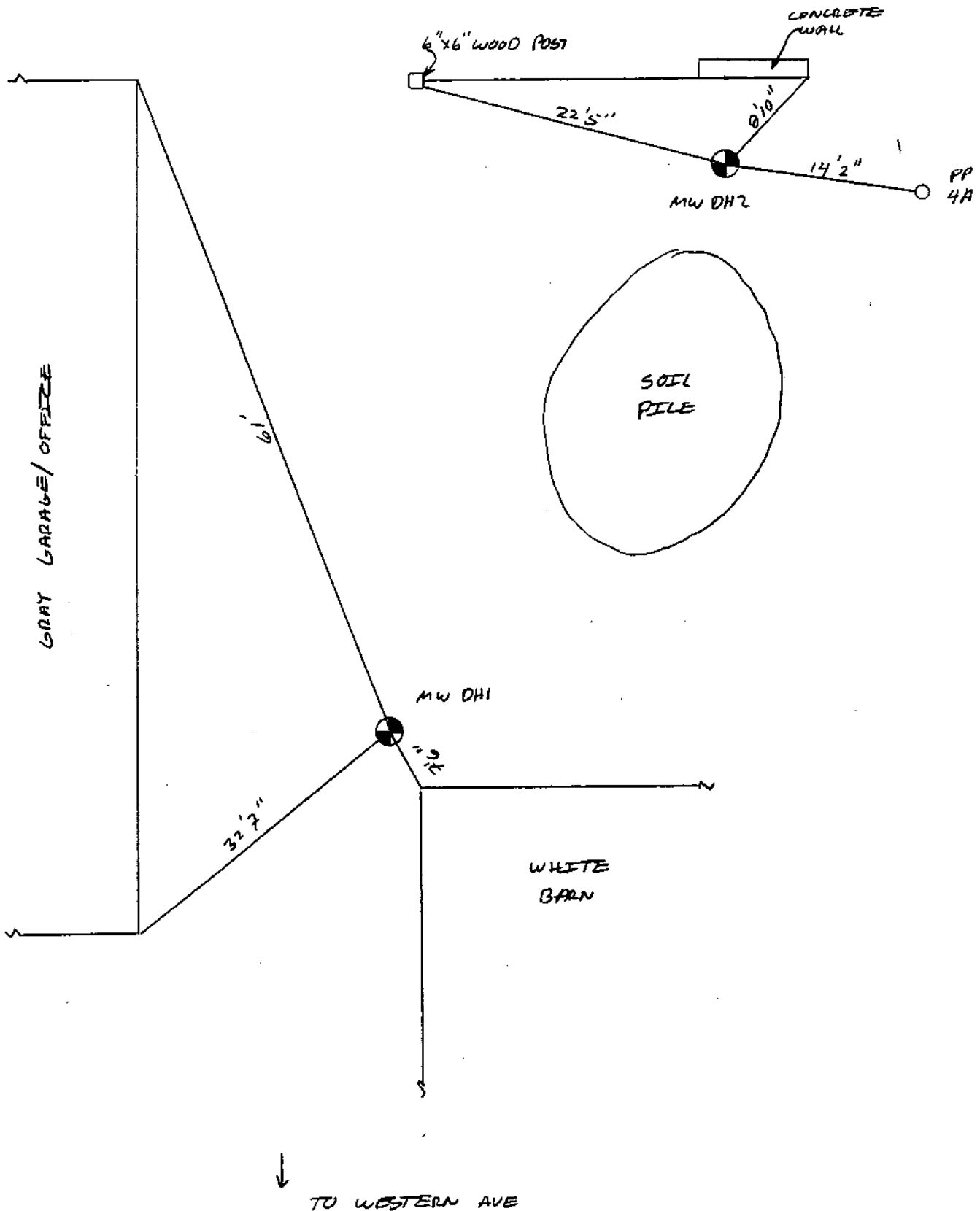
ELEV MSL FT	SAMPLE			SAMP OD IN	LENGTH		REMARKS ON ADVANCE OF BORING	SIZE/TYPE BIT USED TO ADVANCE BORING	SOIL AND ROCK DESCRIPTION
	DEPTH FT	TYPE AND NO.	B		REC IN	PENETRA- TION IN			
	32	SS 5	20 26	2	17	24			31'1" - 32' Light brown, dense, silty SAND. Very fine - fine grained sand. 20% - 30% non plastic fines. Occasional light gray sand layers. Abundant, thin mottles as above. Dry. No odor or staining. 10 - 12 ppm.
									<p>No refusal to depth.]</p> <p>Backfilled boring with native sand to 17'. Bentonite seal 16' - 17'. Silica sand backfill 15' - 16'.</p> <p>Set 10' of 2", .010" slot, threaded, flush joint SCHED 40 PVC at 15'. Silica sand backfill to 4'. Bentonite seal 3' - 4'. Grouted in flush 6" Buffalo box.</p>

<p>B - Penetration resistance, Blows/6" of a 140 lb hammer falling 30 in to drive a split spoon sampler.</p> <p>REC - Length of sample recovered.</p> <p>SS - Split spoon sample.</p> <p>U - Undisturbed samples</p> <p style="margin-left: 20px;">S - Shelby tube N - Denison</p> <p style="margin-left: 20px;">F - Fixed piston P - Pitcher</p> <p style="margin-left: 20px;">O - Osterberg</p> <p>SAMP OD - Outside diameter of sampling spoon</p>	<p>NOTES</p> <p>HSA = Hollow Stem Auger</p> <p>CCH = Conical Cutter Head</p> <p>ppm: Refers to HNU reading (10.2 eV lamp)</p>	<p style="text-align: center;">Town of St. Johnsbury Water & Sewer Department Garage</p> <p>St. Johnsbury, Vermont</p> <p>DATE: 12/31/91 PROJECT: 651033</p>		
		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:50%;">PAGE 2 OF 2</td> <td style="width:50%;">LOG OF BORING: DH2</td> </tr> </table>	PAGE 2 OF 2	LOG OF BORING: DH2
PAGE 2 OF 2	LOG OF BORING: DH2			

DH DUFRESNE-HENRY, INC.

DUFRESNE-HENRY, INC.

PREPARED BY B. Cox DATE 1/6/92 PROJECT NO. 651033
CALCULATIONS CHECKED BY _____ DATE _____ SHEET NO. 1 OF 1
ASSUMPTIONS / METHODS CHECKED BY _____ DATE _____
SUBJECT ST. JOHNSBURY, VT WATER & SEWER DEPT GARAGE



Soils Engineering Inc.

Main St. Charlestown, N. H. 03603

TO DUFRESNE-HENRY ENGINEERING ADDRESS NORTH SPRINGFIELD, VT.
PROJECT NAME WATER & SEWER DEPARTMENT LOCATION ST. JOHNSBURY, VT.
REPORT SENT TO BRUCE COX PROJ. NO. _____
SAMPLE SENT TO RETAINED BY DUFRESNE-HENRY ENGINEERING OUR JOB NO. 5291-92

SHEET 1 OF 3
DATE 12/23/91
HOLE NO. DH-1
LINE & STA. _____
OFFSET _____

GROUND WATER OBSERVATIONS			CASING	SAMPLER	CORE BAR	SURFACE ELEV.
At <u>94'6"</u>	at <u>IMMEDIATELY</u>	Hours	Type <u>HSA</u>	<u>SS</u>		DATE STARTED <u>12/23/91</u>
			Size I. D. <u>4"</u>	<u>1 1/2"</u>		DATE COMPL. <u>12/30/91</u>
At _____	at _____	Hours	Hammer Wt. _____	<u>140#</u>	<u>BIT</u>	BORING FOREMAN <u>M.D. & R.H.</u>
			Hammer Fall _____	<u>30"</u>		INSPECTOR <u>B. COX</u>
						SOILS ENGR. _____

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler			Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hard- ness, Drilling time, seams and etc.	SAMPLE		
				From 0-6	To 6-12	12-18				No.	Pen	Rec.
5'		<u>1'6"-3'6"</u>	<u>SS</u>		<u>11</u>				<u>BROWN GRAVELLY SILTY FINE SAND FILL</u>	<u>1</u>	<u>24"</u>	<u>12"</u>
				<u>18</u>	<u>9</u>					<u>2</u>	<u>24"</u>	<u>12"</u>
		<u>3'6"-5'6"</u>	<u>SS</u>	<u>12</u>	<u>15</u>				<u>LAYERS OF SILTY FINE SAND AND FINE SAND WITH CINDERS</u>	<u>3</u>	<u>24"</u>	<u>18"</u>
		<u>5'6"-7'6"</u>	<u>SS</u>	<u>10</u>	<u>3</u>			<u>5'6"</u>	<u>OLIVE BROWN FINE SILTY SAND</u>	<u>4</u>	<u>24"</u>	<u>18"</u>
10'				<u>4</u>	<u>6</u>				<u>BROWN FINE SILTY SAND</u>	<u>5</u>	<u>24"</u>	<u>18"</u>
		<u>7'6"-9'6"</u>	<u>SS</u>	<u>11</u>	<u>12</u>					<u>6</u>	<u>24"</u>	<u>18"</u>
				<u>11</u>	<u>12</u>					<u>7</u>	<u>24"</u>	<u>19"</u>
		<u>9'6"-11'6"</u>	<u>SS</u>	<u>9</u>	<u>6</u>				<u>SAME MATERIAL</u>	<u>8</u>	<u>24"</u>	<u>20"</u>
15'				<u>6</u>	<u>5</u>					<u>9</u>	<u>24"</u>	<u>18"</u>
		<u>11'6"-13'6"</u>	<u>SS</u>	<u>4</u>	<u>4</u>					<u>10</u>	<u>24"</u>	<u>24"</u>
				<u>5</u>	<u>4</u>					<u>11</u>	<u>24"</u>	<u>12"</u>
		<u>13'6"-15'6"</u>	<u>SS</u>	<u>6</u>	<u>7</u>				<u>PERCHED WATER</u>	<u>12</u>	<u>24"</u>	<u>24"</u>
20'				<u>8</u>	<u>10</u>					<u>13</u>	<u>24"</u>	<u>20"</u>
		<u>15'6"-17'6"</u>	<u>SS</u>	<u>12</u>	<u>7</u>				<u>OLIVE BROWN FINE VERY SILTY SAND</u>	<u>14</u>	<u>24"</u>	<u>21"</u>
				<u>10</u>	<u>10</u>					<u>15</u>	<u>24"</u>	<u>15"</u>
		<u>17'6"-19'6"</u>	<u>SS</u>	<u>14</u>	<u>13</u>					<u>16</u>	<u>24"</u>	<u>12"</u>
25'				<u>14</u>	<u>14</u>					<u>17</u>	<u>24"</u>	<u>18"</u>
		<u>19'6"-21'6"</u>	<u>SS</u>	<u>15</u>	<u>7</u>					<u>18</u>	<u>24"</u>	<u>16"</u>
				<u>9</u>	<u>9</u>							
		<u>21'6"-23'6"</u>	<u>SS</u>	<u>6</u>	<u>7</u>			<u>21'6"</u>	<u>LAYERS OF OLIVE BROWN SILT AND FINE SILTY SAND</u>	<u>19</u>	<u>24"</u>	<u>20"</u>
30'				<u>13</u>	<u>14</u>					<u>20</u>		
		<u>23'6"-25'6"</u>	<u>SS</u>	<u>14</u>	<u>9</u>				<u>LIGHT GREY FINE SAND</u>	<u>21</u>		
				<u>13</u>	<u>14</u>					<u>22</u>		
		<u>25'6"-27'6"</u>	<u>SS</u>	<u>12</u>	<u>10</u>				<u>SAME MATERIAL WITH 4" SILT LAYER</u>	<u>23</u>		
35'				<u>15</u>	<u>17</u>					<u>24</u>		
		<u>27'6"-29'6"</u>	<u>SS</u>	<u>12</u>	<u>12</u>				<u>BROWN FINE SAND</u>	<u>25</u>		
				<u>17</u>	<u>18</u>					<u>26</u>		
		<u>29'6"-31'6"</u>	<u>SS</u>	<u>19</u>	<u>7</u>					<u>27</u>		
40'				<u>19</u>	<u>20</u>					<u>28</u>		
		<u>31'6"-33'6"</u>	<u>SS</u>	<u>23</u>	<u>17</u>					<u>29</u>		
				<u>16</u>	<u>38</u>					<u>30</u>		
		<u>33'6"-35'6"</u>	<u>SS</u>	<u>35</u>	<u>16</u>					<u>31</u>		
				<u>16</u>	<u>19</u>					<u>32</u>		
		<u>35'6"-37'6"</u>	<u>SS</u>	<u>27</u>	<u>15</u>				<u>SAME MATERIAL</u>	<u>33</u>		
				<u>17</u>	<u>19</u>					<u>34</u>		
				<u>23</u>						<u>35</u>		
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										<u>98</u>		
										<u>99</u>		
										<u>100</u>		

GROUND SURFACE TO _____

USED _____

"CASING: _____

THEN _____

140 lb. Wt. x 30" fall an 2" O. D. Sampler

Sample Type
D—Dry C—Cored W—Washed
UP—Undisturbed Piston
TP—Test Pit A—Auger V—Vane Test
UT—Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft 30 + Hard
4-8 M/Stiff
8-15 Shff
15-30 V-Shff

SUMMARY

Earth Boring _____
Rock Coring _____
Samples _____

HOLE NO. DH-1

L.W. NG 40-50-70-20

Soils Engineering Inc.

Main St.

Charlestown, N. H. 03603

TO DUFRESNE-HENRY ENGINEERING

ADDRESS NORTH SPRINGFIELD, VT

PROJECT NAME WATER & SEWER DEPARTMENT

LOCATION ST. JOHNSBURY, VT

REPORT SENT TO BRUCE COX

PROJ. NO.

SAMPLE SENT TO RETAINED BY DUFRESNE-HENRY ENGINEERING

OUR JOB NO. 5291-92

SHEET 2 OF 3

DATE 12/23/91

HOLE NO. DH-1

LINE & STA.

OFFSET

GROUND WATER OBSERVATIONS			CASING	SAMPLER	CORE BAR	SURFACE ELEV.
At <u>94'6"</u>	at <u>IMMEDIATELY</u>	Hours	Type <u>HSA</u>	<u>SS</u>		DATE STARTED <u>12/23/91</u>
			Size I. D. <u>4"</u>	<u>1 1/2"</u>		DATE COMPL. <u>12/30/91</u>
At	at	Hours	Hammer Wt.	<u>140#</u>	<u>BIT</u>	BORING FOREMAN <u>M.D. & R.H.</u>
			Hammer Fall	<u>30"</u>		INSPECTOR <u>B. COX</u>
						SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler			Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE		
				From 0-6	To 6-12	12-18				No.	Pen	Rec.
				21	27				BROWN FINE SAND	19	24"	20"
45'		45' -47'	SS	12	19				SAME MATERIAL - SLIGHTLY MORE COARSE	20	24"	18"
				21	26							
50'		50' -52'	SS	14	19				SAME MATERIAL	21	24"	18"
				17	20							
55'		55' -57'	SS	22	27				SAME MATERIAL	22	24"	14"
				38	40							
60'		60' -62'	SS	15	20				SAME MATERIAL	23	24"	18"
				24	25							
65'		65' -67'	SS	15	20				SAME MATERIAL	24	24"	18"
				28	28							
70'		70' -72'	SS	23	31				SAME MATERIAL	25	24"	18"
				35	36							
75'		75' -77'	SS	22	24				SAME MATERIAL WITH 2" LAYER OF FINE SILTY SAND	26	24"	18"
				27	27							
80'		80' -82'	SS	21	26				BROWN FINE SAND WITH 1/8" LAYER OF SILT	27	24"	18"

GROUND SURFACE TO

USED

"CASING: THEN

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type

D—Dry C—Cored W—Washed
UP—Undisturbed Piston
TP—Test Pit A—Auger V—Vane Test
UT—Undisturbed Thinwall

Proportions Used

trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

Cohesionless Density

0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency

0-4 Soft 30 + Hard
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff

SUMMARY

Earth Boring
Rock Coring
Samples

HOLE NO. DH-1

Soils Engineering Inc.

Main St.

Charlestown, N. H. 03603

TO DUFRESNE-HENRY ENGINEERING

ADDRESS NORTH SPRINGFIELD, VT

PROJECT NAME WATER & SEWER DEPARTMENT

LOCATION ST. JOHNSBURY, VT

REPORT SENT TO BRUCE COX

PROJ. NO.

SAMPLE SENT TO RETAINED BY DUFRESNE-HENRY ENGINEERING OUR JOB NO. 5291-92

SHEET 3 OF 3

DATE 12/23/91

HOLE NO. DH-1

LINE & STA.

OFFSET

GROUND WATER OBSERVATIONS

At 94'6" at IMMEDIATELY Hours

Type

CASING

HSA

SAMPLER

SS

CORE BAR

SURFACE ELEV.

DATE STARTED 12/23/91

DATE COMPL 12/30/91

BORING FOREMAN H.D. & R.H.

INSPECTOR B. COX

SOILS ENGR.

At at Hours

Size I. D.

4"

1 1/2"

Hammer Wt.

140#

BIT

Hammer Fall

30"

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler			Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hard- ness, Drilling time, seams and etc.	SAMPLE			
				From To						No.	Pen	Rec.	
				0-6	6-12	12-18							
85'				35	44		MOIST TO WET	86'	BROWN FINE SAND WITH 1/8" LAYER OF SILT				
	85' -87'	SS	19	37							28	24"	16"
			52	58									
90'							MOIST TO WET	100'	LIGHT GREY FINE SAND WITH 2" SILTY SAND LAYER				
	90' -91'6"	SS	33	51							29	18"	17"
			55										
95'							MOIST TO WET	100'	OLIVE BROWN FINE MED. FINE SAND				
	95' -96'6"	SS	33	39							30	18"	15"
			51										
100'							MOIST TO WET	100'	INSTALLED 2" PVC WELL @ 100'6" SLOTTED 90'6" - 100'6" SAND TO 87' BENTONITE 86' - 87'				
							</						

MOIST
TO
WET

GROUND SURFACE TO 100'

USED HSA

"CASING: THEN

140 lb. Wt. x 30' fall an 2" O. D. Sampler

Sample Type

D—Dry C—Cored W—Washed
UP—Undisturbed Piston
TP—Test Pit A—Auger V—Vane Test
UT—Undisturbed Thinwall

Proportions Used

trace 0 to 10 %
little 10 to 20 %
some 20 to 35 %
and 35 to 50 %

Cohesionless Density

0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency

0-4 Soft 30 + Hard
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff

SUMMARY

Earth Boring 100'
Rock Coring
Samples 30

HOLE NO. DH-1

Soils Engineering Inc.

Main St.

Charlestown, N. H. 03603

TO DUFRESNE-HENRY ENGINEERING ADDRESS NORTH SPRINGFIELD, VT.
 PROJECT NAME WATER & SEWER DEPARTMENT LOCATION ST. JOHNSBURY, VT.
 REPORT SENT TO BRUCE COX PROJ. NO.
 SAMPLE SENT TO RETAINED BY DUFRESNE-HENRY ENGINEERING OUR JOB NO. 5291-92

SHEET 1 OF 2
 DATE 12/31/91
 HOLE NO. DH-2
 LINE & STA.
 OFFSET

GROUND WATER OBSERVATIONS			CASING	SAMPLER	CORE BAR.	SURFACE ELEV.
At <u>NONE</u>	at <u></u>	Hours	Type <u>HSA</u>	<u>SS</u>		DATE STARTED <u>12/31/91</u>
			Size I. D. <u>4 1/4"</u>	<u>1 1/2"</u>		DATE COMPL. <u>12/31/91</u>
			Hammer Wt. <u></u>	<u>140#</u>	<u>BIT</u>	BORING FOREMAN <u>M.D. & R.H.</u>
At <u></u>	at <u></u>	Hours	Hammer Fall <u></u>	<u>30"</u>		INSPECTOR <u>B. COX</u>
						SOILS ENGR. <u></u>

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler			Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hard- ness, Drilling time, seams and etc.	SAMPLE		
				From To						No.	Pen	Rec.
				0-6	6-12	12-18						
5'		5' - 7'	SS	2	3		MOIST		OLIVE BROWN VARVED SILT AND CLAY	1	24"	24"
				2	1							
10'		10' - 12'	SS	4	4		VERY MOIST		OLIVE BROWN SILT	2	24"	24"
				5	7							
							MOIST	12'				
15'		15' - 17'	SS	9	12		DRY		BROWN FINE SILTY SAND	3	24"	18"
				14	14			BROWN FINE SILTY SAND - OLD GAS ODOR				
20'		20' - 22'	SS	6	10			SAME MATERIAL - GAS ODOR	4	24"	18"	
				12	17							
25'		25' - 27'	SS	12	17				SAME MATERIAL - SLIGHT ODOR	5	24"	16"
				16	16							
30'		30' - 32'	SS	11	16			31'	BROWN SILTY FINE SAND	6	24"	17"
				20	26				BROWN FINE SAND - NO ODOR			
35'									INSTALLED 2" PVC WELL AT 15' SLOTTED 5' - 15' SAND TO 4' BENTONITE 3' - 4'			
									MATERIALS USED: SEE PAGE 2 OF 2			

GROUND SURFACE TO

USED

CASING:

THEN

140 lb. Wt. x 30" fall on 2" O. D. Sampler

Sample Type

Proportions Used

Cohesionless Density

Cohesive Consistency

D—Dry C—Cored W—Washed
 UP—Undisturbed Piston
 TP—Test Pit A—Auger V—Vane Test
 UT—Undisturbed Thinwall

trace 0 to 10%
 little 10 to 20%
 some 20 to 35%
 and 35 to 50%

0-10 Loose
 10-30 Med. Dense
 30-50 Dense
 50 + Very Dense

0-4 Soft 30 + Hard
 4-8 M/Stiff
 8-15 Shff
 15-30 V-Shff

SUMMARY

Earth Boring
 Rock Coring
 Samples

HOLE NO. DH-2

BORING 40-500 70/24

Soils Engineering Inc.

Main St. Charlestown, N. H. 03603

TO DUFRESNE-HENRY ENGINEERING ADDRESS NORTH SPRINGFIELD, VT
 PROJECT NAME WATER & SEWER DEPARTMENT LOCATION ST. JOHNSBURY, VT
 REPORT SENT TO BRUCE COX PROJ. NO. 5291-92
 SAMPLE SENT TO RETAINED BY DUFRESNE-HENRY ENGINEERING OUR JOB NO. 5291-92

SHEET 2 OF 2
 DATE 12/31/91
 HOLE NO. DH-2
 LINE & STA.
 OFFSET

GROUND WATER OBSERVATIONS			CASING	SAMPLER	CORE BAR	SURFACE ELEV.
At <u>NONE</u>	at <u> </u>	Hours	Type <u>HSA</u>	<u>SS</u>	<u> </u>	DATE STARTED <u>12/31/91</u>
			Size I. D. <u>4 1/4"</u>	<u>1 1/2"</u>	<u> </u>	DATE COMPL <u>12/31/91</u>
			Hammer Wt. <u> </u>	<u>140#</u>	<u>BIT</u>	BORING FOREMAN <u>M.D. & R.H.</u>
			Hammer Fall <u> </u>	<u>30"</u>	<u> </u>	INSPECTOR <u>B. COX</u>
						SOILS ENGR. <u> </u>

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From — To	Type of Sample	Blows per 6" on Sampler			Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION	SAMPLE		
				Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.					No.	Pen	Rec.	
				From	To							
				0-6	6-12	12-18						
									MATERIALS USED: 10' OF 2" PVC 0.010" SCREEN 5' OF 2" PVC SOLID 50# OF BENTONITE 300# OF SAND 25# OF CEMENT MIX 1 BUFFALO CAP 1 THREADED PVC CAP 1 EXPANSION			

GROUND SURFACE TO 30"

USED HSA

"CASING: THEN SS 30' - 32'

140 lb. Wt. x 30 1/4" fall an 2" O. D. Sampler

Sample Type

D—Dry C—Cored W—Washed
 UP—Undisturbed Piston
 TP—Test Pit A—Auger V—Vane Test
 UT—Undisturbed Thinwall

Proportions Used

trace 0 to 10 %
 little 10 to 20 %
 some 20 to 35 %
 and 35 to 50 %

Cohesionless Density

0-10 Loose
 10-30 Med. Dense
 30-50 Dense
 50 + Very Dense

Cohesive Consistency

0-4 Soft 30 + Hard
 4-8 M/Stiff
 8-15 Stiff
 15-30 V-Stiff

SUMMARY

Earth Boring 32'
 Rock Coring
 Samples 6

HOLE NO. DH-2

BORING 40-3020 70/32

APPENDIX D

ANALYSIS RESULTS



AMERICAN ENVIRONMENTAL LABORATORIES, INC.

60 Elm Hill Ave. Leominster, MA 01453

REPORT NO. 19207-178

(508) 534-1444

LAB ID #MA076 800-LAB-0094

SAMPLE INFORMATION

Requested By: **Dufrense-Henry, Inc.**
Address: **Precision Park**
City: **No. Springfield, VT 05150**
Sample ID: **PO No: 651033**
Matrix: **Solid**
Sample Location (if different):

Date Received: **01/07/92**
Date Analyzed: **01/09/92**
Collected By: **Same**
ATTN: **Ted Reeves**

MW DH2-5'-10'

PARAMETER	RESULT(ug/kg)	MDL(ug/kg)
Benzene	740	1.0
Chlorobenzene	ND	2.0
1,2 Dichlorobenzene	ND	2.5
1,3 Dichlorobenzene	ND	2.0
1,4 Dichlorobenzene	ND	3.0
Ethylbenzene	1,000	2.0
Toluene	2,200	2.0
Xylene	3,100	3.0
Methyl-Tert-Butyl-Ether	1,400	5.0

Matrix:

Sample Dilution:

Internal Standard:

Comments:

Analyst: 

EPA 8020

Eric Koslowski

★ = Exceeds EPA Proposed MCL Limits
MDL = Minimum Detection Limit
MCL LIMIT = Proposed EPA Maximum contaminant level
ND = Level present is below detection limit
NT = Not Tested

"PLEASE NOTE"

The results here, can not be reproduced in whole or in part without our prior consent. The results apply only to the actual sample tested. American shall be held harmless from any liability arising out of the use of such results. The integrity of the sample and results is dependent on the quality of sampling.



AMERICAN ENVIRONMENTAL LABORATORIES, INC.

60 Elm Hill Ave. Leominster, MA 01453

REPORT NO. 19207-179

(508) 534-1444

LAB ID #MA076

800-LAB-0094

SAMPLE INFORMATION

Requested By : Dufrense-Henry, Inc.
Address : Precision Park
City : No. Springfield, VT 05150
Sample ID : PO No: 651033
Matrix : Solid
Sample Location (if different):

Date Received : 01/07/92
Date Analyzed : 01/09/92
Collected By : Same
ATTN: Ted Reeves

MW DH2 15'-25'

PARAMETER	RESULT(ug/kg)	MDL(ug/kg)
Benzene	ND	1.0
Chlorobenzene	ND	2.0
1,2 Dichlorobenzene	ND	2.5
1,3 Dichlorobenzene	ND	2.0
1,4 Dichlorobenzene	ND	3.0
Ethylbenzene	ND	2.0
Toluene	ND	2.0
Xylene	ND	3.0
Methyl-Tert-Butyl-Ether	ND	5.0

Matrix:

Sample Dilution:

Internal Standard:

Comments:

Analyst :

PP

★ = Exceeds EPA Proposed MCL Limits
MDL = Minimum Detection Limit
MCL LIMIT = Proposed EPA Maximum contaminant level
ND = Level present is below detection limit
NT = Not Tested

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REPORT NO. 19207-178



AMERICAN ENVIRONMENTAL LABORATORIES, INC.

(508) 534-1444

60 Elm Hill Ave. Leominster, MA 01453

LAB ID #MA076

800-LAB-0094

SAMPLE INFORMATION

Requested By : Dufresne-Henry, Inc.
Address : Precision Park
City : No. Springfield, VT 05150
Sample ID : PO No: 651033
Matrix : Solid
Sample Location (if different): Town of St. Johnsbury, VT Water & Sewer Dept. Garage

Date Received : 01/07/92
Date Analyzed : 01/08/92
Collected By : Bruce Cox

ATTN: Ted Reeves

PARAMETER	RESULT	MCL	MDL	UOM	METHOD NO.
T. Petroleum Hydrocarbon	109		5.0	mg/kg	SM# 503B & SM# 503E

Comments:

Misc

Analyst: Eric Koslowski

★ = Exceeds EPA Proposed MCL Limits
MDL = Minimum Detection Limit
MCL LIMIT = Proposed EPA Maximum contaminant level
ND = Level present is below detection limit
NT = Not Tested

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AMERICAN ENVIRONMENTAL LABORATORIES, INC.

60 Elm Hill Ave. Leominster, MA 01453

REPORT NO. 19203-74

(508) 534-1444

LAB ID #MA076 800-LAB-0094

SAMPLE INFORMATION

Requested By: Dufrense-Henry
Address: Precision Park
City: N. Springfield, VT 05150
Sample ID: PO No: 651033
Matrix: Water
Sample Location (if different):

Date Received: 01/03/92
Date Analyzed: 01/07/92
Collected By: Alec Hastings
St. Johnsbury Water Dept.
MW-1 Date Sampled: 01/02/92

PARAMETER	RESULT(ug/l)	MDL(ug/l)
Benzene	ND	1.0
Chlorobenzene	ND	2.0
1,2 Dichlorobenzene	ND	2.5
1,3 Dichlorobenzene	ND	2.0
1,4 Dichlorobenzene	ND	3.0
Ethylbenzene	ND	2.0
Toluene	ND	2.0
Xylene	ND	3.0
Methyl-Tert-Butyl-Ether	ND	5.0

Comments:

EPA 602

Analyst: Eric Koslowski

RMT

★ = Exceeds EPA Proposed MCL Limits
MDL = Minimum Detection Limit
MCL LIMIT = Proposed EPA Maximum contaminant level
ND = Level present is below detection limit
NT = Not Tested

PLEASE NOTE

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REPORT NO. 19203-75



AMERICAN ENVIRONMENTAL LABORATORIES, INC.

(508) 534-1444

60 Elm Hill Ave. Leominster, MA 01453

LAB ID #MA076

800-LAB-0094

SAMPLE INFORMATION

Requested By : Dufrense-Henry
Address : Precision Park
City : N. Springfield, VT 05150
Sample ID : PO No: 651033
Matrix : Water
Sample Location (if different):

Date Received : 01/03/92
Date Analyzed : 01/07/92
Collected By : Alec Hastings
St. Johnsbury Water Dept.
Field Blank Date Sampled: 01/02/92

PARAMETER	RESULT(ug/l)	MDL(ug/l)
Benzene	ND	1.0
Chlorobenzene	ND	2.0
1,2 Dichlorobenzene	ND	2.5
1,3 Dichlorobenzene	ND	2.0
1,4 Dichlorobenzene	ND	3.0
Ethylbenzene	ND	2.0
Toluene	ND	2.0
Xylene	ND	3.0
Methyl-Tert-Butyl-Ether	ND	5.0

Comments:

EPA 602

Analyst: Eric Koslowski

RMT

★ = Exceeds EPA Proposed MCL Limits

MDL = Minimum Detection Limit

LIMIT = Proposed EPA Maximum contaminant level

level present is below detection limit

tested

"PLEASE NOTE"

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